Level 2 Technical Certificate in Electrical Installation
Level 2 Electrical Installation – Theory exam

Thursday 28 June 2018
09:30 – 11:30

You should have the following for this examination
• a multiple-choice answer sheet
• a pen with black or blue ink
• non-programmable calculator

Permitted reference material:
• BS 7671 (2015)
• IET On-site Guide

This question paper is the property of the City and Guilds of London Institute and is to be returned after the examination.

Read the following notes before you answer any questions
• You must use a pen with black or blue ink to complete all parts of the answer sheet.
• Check that you have the correct answer sheet for the examination.
• Check that your name and candidate details are printed correctly at the top of your answer sheet.
• Inform the invigilator if your name or examination details are not correct.
• Each question shows four possible answers (lettered ‘a’, ‘b’, ‘c’ and ‘d’); only one is correct.
• Decide which one is correct and mark your answer on the answer sheet with your pen.

For example if you decide ‘a’ is correct, mark your answer like this

If you want to change your answer, cancel your first choice by filling in the ‘cancel’ box below the circle like this

Then mark the answer which you have now decided is correct. For example if you now decide ‘c’ is correct, mark your answer like this

Any other marks on the form may invalidate some of your answers.

• Any calculations or rough working can be done on the question paper.
• Attempt all questions. If you find a question difficult, leave it and return to it later.

This paper contains 60 questions. Answer them using the ‘boxes’ numbered 1 to 60 on the answer sheet.
1 What is an organisational responsibility with regards to PPE?
   a Must be worn at all times.
   b Any defects must be reported.
   c Training and information on its use must be provided.
   d Must be used in accordance with any training provided.

2 What regulation does the symbol, in Figure 1, apply to?
   a WEEE.
   b EAWR.
   c Control of Noise Regulations.
   d The Pollution Prevention and Control Act.

3 What document sets out a systematic approach for a set task?
   a Permit to work.
   b Method statement.
   c Risk assessment.
   d Job sheet.

4 What is the immediate action that must be taken upon discovering a colleague being exposed to an electric shock?
   a Pull the casualty away.
   b Call for medical assistance.
   c Switch off the main supply.
   d Assess the situation.

5 Which personnel is concerned with the design and physical integrity of buildings and other large structures?
   a Site Manager.
   b Safety Officer.
   c Structural Engineer.
   d Site Supervisor.

6 What job role entails checking the quality of materials and installation meets the client’s requirements?
   a Clerk of Works.
   b Project Manager.
   c Contracts Manager.
   d Quantity Surveyor.

7 What value is required to determine circuit power where only the circuit resistance is known?
   a \( I^2 \)
   b \( Z_s \)
   c \( E \)
   d \( L \)

8 What value represents 1 M\( \Omega \)?
   a \( 1 \times 10^{-6} \Omega \)
   b \( 1 \times 10^{-3} \Omega \)
   c \( 1 \times 10^3 \Omega \)
   d \( 1 \times 10^6 \Omega \)

9 According to Ohms Law, which is the correct formula?
   a \( R = V \times I \)
   b \( R = \sqrt{V^2 + I^2} \)
   c \( R = \frac{I}{V} \)
   d \( R = \frac{V}{I} \)

10 What is the sum of all the angles in a right angle triangle?
    a 60.
    b 90.
    c 180.
    d 360.
11 What is the value of angle A shown in Figure 2?
   a 30.96
   b 36.87
   c 50.31
   d 53.13

12 What part of the atom is negatively charged?
   a Proton.
   b Nucleus.
   c Electron.
   d Neutron.

13 What material is used as an insulator?
   a Tungsten.
   b Porcelain.
   c Mercury.
   d Carbon.

14 Which insulator is Hydroscopic?
   a Mica.
   b Bakelite.
   c Polyvinyl chloride.
   d Magnesium oxide.

15 How much power is dissipated by a 25 Ω resistor when 4 A flows through it?
   a 0.4 W
   b 40 W
   c 0.4 kW
   d 40 kW

16 What calculation would be used to calculate total resistance in a series circuit?
   a \( R_1 + R_2 + R_3 \)
   b \( \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} \)
   c \( \frac{1}{R_1} \times \frac{1}{R_2} \times \frac{1}{R_3} \)
   d \( R_1 \times R_2 \times R_3 \)

17 What is the length of a 2.5 mm² copper conductor having a resistance of 0.207 Ω at 20 °C?
The resistivity of copper is 0.0172 µΩ/m.
   a 20 m
   b 30 m
   c 40 m
   d 50 m

18 Three resistors of 12 Ω, 6 Ω and 4 Ω are connected in parallel. What is the total circuit resistance?
   a 0.5 Ω
   b 2 Ω
   c 22 Ω
   d 288 Ω

19 What is the total current for the circuit in Figure 3?
   a 3.83 A
   b 1.51 A
   c 0.66 A
   d 0.25 A
20 What two values does a wattmeter measure?
   a  Voltage and resistance.
   b  Capacitance and resistance.
   c  Voltage and current.
   d  Current and capacitance.

21 What is the unit of measure for magnetic flux?
   a  Weber.
   b  Henrys.
   c  Kelvin.
   d  Hertz.

22 What is the flux density when a conductor of effective length 0.25 m is moving at right angles through a magnetic field at a velocity of 5 m/s and is generating 1.375 V?
   a  1.1 T
   b  2.1 T
   c  3.375 T
   d  6.625 T

23 What is the output voltage of a transformer that is rated at 150 kVA and delivers 375 A at full load?
   a  56 kV
   b  525 V
   c  400 V
   d  225 V

24 How many primary turns will a 200 kVA, 3.3 kV/240 V 50 Hz single-phase transformer have, when there are 80 turns on the secondary winding?
   a  1100 turns.
   b  833 turns.
   c  60 turns.
   d  3 turns.

25 What is Fleming’s formula for calculating force?
   a  \( F = B + I + L \)
   b  \( F = \frac{B}{I - L} \)
   c  \( F = \frac{B}{I \times L} \)
   d  \( F = B \times I \times L \)

26 What is the unit of measurement for inductance?
   a  Ohms.
   b  Henrys.
   c  Farads.
   d  Siemens.

27 What is the operating principle of a double-wound transformer?
   a  Self-induction.
   b  Shared-induction.
   c  Mutual induction.
   d  Opposed induction.

28 What is the RMS voltage of a sine wave having a peak value of 90 V?
   a  127.3 V
   b  102.69 V
   c  78.89 V
   d  63.63 V

29 What passive component is used to reduce current in an electronic circuit?
   a  Resistor.
   b  Thyristor.
   c  Transistor.
   d  Amplifier.

30 What must be performed before using the equipment shown in Figure 4, on site?
   a  Earth leakage test.
   b  GS 38 checks.
   c  User checks.
   d  Earth bond test.
31 What is the **minimum** distance required, from the top of a floor joist, for a hole used to pass cables through?

a  50 mm  
b  60 mm  
c  70 mm  
d  80 mm  

32 What is the **most** suitable cable for a fire alarm sounder installation?

a  Cat 5.  
b  Fibre optic.  
c  Cat 6.  
d  MIMS.  

33 What is the item shown in Figure 5 used for?

a  Drawing in.  
b  Dressing in.  
c  Filling in.  
d  Forming in.  

34 What type of conduit set is shown in Figure 6?

a  Double set.  
b  Bubble set.  
c  180 bend.  
d  Kick.  

35 What type of cable would be supported by the item shown in Figure 7?

a  PVC SWA.  
b  MICC.  
c  SY Flex.  
d  Twin and cpc.  

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Figure 5

Figure 6

Figure 7
36 What is the **minimum** height that cables must be installed at, on a catenary system above a walkway?
   a  2.5 m  
   b  3 m  
   c  3.5 m  
   d  4 m

37 What External Influence within BS 7671 would affect the selection of a containment system?
   a  Capacity.  
   b  Utilisation.  
   c  Suitability.  
   d  Affordability.

38 What support system would be **most** suitable for running a large SWA up a building electrical riser?
   a  Trunking.  
   b  Basket.  
   c  Ladder.  
   d  Conduit.

39 What factor will affect the **minimum** permissible csa of a cable?
   a  Cost.  
   b  Load.  
   c  Aesthetics.  
   d  Practicality.

40 What is the nominal voltage (AC) indicated by a red BS EN 60309 socket?
   a  400 V  
   b  230 V  
   c  110 V  
   d  50 V

41 What termination method is used to connect a conductor to a large busbar system?
   a  Solder.  
   b  Crimp.  
   c  Welded.  
   d  Brazed.

42 What is a transmission voltage?
   a  11 kV  
   b  25 kV  
   c  33 kV  
   d  400 kV

43 Who is responsible for the electrical meter in a domestic installation?
   a  The owner.  
   b  The electrician.  
   c  The energy supplier.  
   d  The occupant.

44 What device provides **Additional Protection** against electric shock?
   a  RCD.  
   b  MCB.  
   c  BS 88 Fuse.  
   d  BS 3036 Fuse.

45 Which supply system uses a Protective Earth and Neutral conductor?
   a  TT  
   b  TN-S  
   c  IT  
   d  TN-C-S

46 Which supply system would have a $R_A$ value?
   a  TT  
   b  TN-S  
   c  TN-C  
   d  TN-C-S

47 Which protective device requires a rating factor of 0.725?
   a  BS 88-3  
   b  BS 3036  
   c  BS 1362  
   d  BS 88-2

48 Which of the following is a **Protective Measure** against faults as given in BS 7671?
   a  ADS.  
   b  Barriers.  
   c  RCD.  
   d  Insulation.

49 Which of the following **must** be Earthed?
   a  Metallic service pipe.  
   b  Metallic luminaire.  
   c  Steel air ducting.  
   d  Structural steel.
50 What is the purpose of Basic Protection?
   a) To protect cables.
   b) To protect equipment.
   c) To prevent electric shock.
   d) To prevent damage to installation.

51 Why are Earthing conductors installed?
   a) To connect together exposed and extraneous conductive parts.
   b) To provide a link between all extraneous conductive parts.
   c) To achieve basic protection.
   d) To achieve fault protection.

52 What accessible parts would require a Protective Bonding Conductor connection?
   a) Steel structural beams.
   b) Metallic conduit system.
   c) Steel trunking system.
   d) Metallic cable tray.

53 A circuit supplying a 13 A load is wired using a cable having a stated voltage drop of 11 mV/A/m and a length of 32 m. What would be the voltage drop for this circuit?
   a) 0.45 V
   b) 3.52 V
   c) 4.58 V
   d) 9.15 V

54 What does Part M of the Building Regulations give guidance on?
   a) Heights of socket-outlets.
   b) Fire compartments in buildings.
   c) Energy efficiency of lighting circuits.
   d) Depths of cables chases in walls.

55 What type of drawing is commonly used to show the positioning of electrical equipment?
   a) Circuit.
   b) Layout.
   c) Wiring.
   d) Schematic.

Questions 56 to 60 refer to the following scenario.
A new single-phase electrical installation within an office is to be wired using PVC/PVC insulated and sheathed flat profile 70 °C thermoplastic cable. Data cables are to be installed by a subcontractor using the same containment systems, and the Z_e value for this installation is 0.35 Ω.

The cables are to be installed using a mixture of surface, PVC conduit, metallic cable tray and PVC two-compartment dado trunking. The schedule for the final circuits is shown in the table below.

The installation supply is to be supported via a solar photovoltaic system to be installed on the flat roof of the building which is 6 m from ground level.

<table>
<thead>
<tr>
<th>No</th>
<th>Designation</th>
<th>Live mm²</th>
<th>CPC mm²</th>
<th>Type of Protective Device</th>
<th>Circuit Length</th>
<th>Conductor Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Radial power</td>
<td>2.5</td>
<td>1.5</td>
<td>BS EN 61009</td>
<td>15 m</td>
<td>Copper</td>
</tr>
<tr>
<td>2</td>
<td>Radial power</td>
<td>2.5</td>
<td>1.5</td>
<td>BS EN 61009</td>
<td>25 m</td>
<td>Copper</td>
</tr>
<tr>
<td>3</td>
<td>Ring final circuit</td>
<td>2.5</td>
<td>1.5</td>
<td>BS EN 61009</td>
<td>25 m</td>
<td>Copper</td>
</tr>
<tr>
<td>4</td>
<td>Ring final circuit</td>
<td>2.5</td>
<td>1.5</td>
<td>BS EN 61009</td>
<td>10 m</td>
<td>Copper</td>
</tr>
<tr>
<td>5</td>
<td>2 kW Space heater</td>
<td>2.5</td>
<td>1.5</td>
<td>BS EN 61009</td>
<td>20 m</td>
<td>Copper</td>
</tr>
<tr>
<td>6</td>
<td>2 kW Water heater</td>
<td>2.5</td>
<td>1.5</td>
<td>BS EN 61009</td>
<td>15 m</td>
<td>Copper</td>
</tr>
<tr>
<td>7</td>
<td>6 x 100 W luminaires</td>
<td>1.5</td>
<td>1.5</td>
<td>BS EN 61009</td>
<td>35 m</td>
<td>Copper</td>
</tr>
<tr>
<td>8</td>
<td>6 x 100 W luminaires</td>
<td>1.5</td>
<td>1.5</td>
<td>BS EN 61009</td>
<td>25 m</td>
<td>Copper</td>
</tr>
</tbody>
</table>

Table 1

56 Why is compartmental trunking utilised within this installation?
   a) To keep different coloured cables apart.
   b) To separate Band I and Band II circuits.
   c) To separate cables to reduce eddy currents.
   d) To keep lighting and power circuits apart.

57 When a ladder is only anchored at ground level, what is the required minimum length to enable the inspection of the solar photovoltaic panels?
   a) 6.2 m
   b) 7.2 m
   c) 8.2 m
   d) 9.2 m
58 Which part of the RCBO operates under overload conditions?
   a Residual current trip.
   b Electro-magnetic trip.
   c Chemical trip.
   d Thermal trip.

59 What is the $Z_s$ value for circuit 5, shown in Table 1, if the installation conditions result in the conductors operating at their maximum operating temperature?
   a $0.39 \, \Omega$
   b $0.68 \, \Omega$
   c $0.74 \, \Omega$
   d $0.82 \, \Omega$

60 Why does BS 7671 recommend neutrals to be installed at light switches?
   a To facilitate electronic switching devices.
   b To ensure short circuits are avoided.
   c To enable lights to be fully isolated.
   d To provide emergency lighting test facilities.

NOW GO BACK AND CHECK YOUR WORK
• IMPORTANT -
  Are the details at the top of the answer sheet correct?
  Have you filled in your answers in INK in the appropriate boxes on the answer sheet?